Retrieving Coastal Optical Properties from MERIS

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Objectives

- Compare MERIS Remote Sensing Reflectance and Optical Properties in a variety of clear and turbid water types under varying atmospheric conditions using two different atmospheric correction approaches.

- Compare MERIS and MODIS-Aqua optical properties.

- Validate MERIS and MODIS-Aqua Remote Sensing Reflectances using insitu measurements.

MERIS Sensor

Operational MERIS Processing in NRL's Automated Processing System (APS):

- Input ESA Level-1 / Level-2 Data

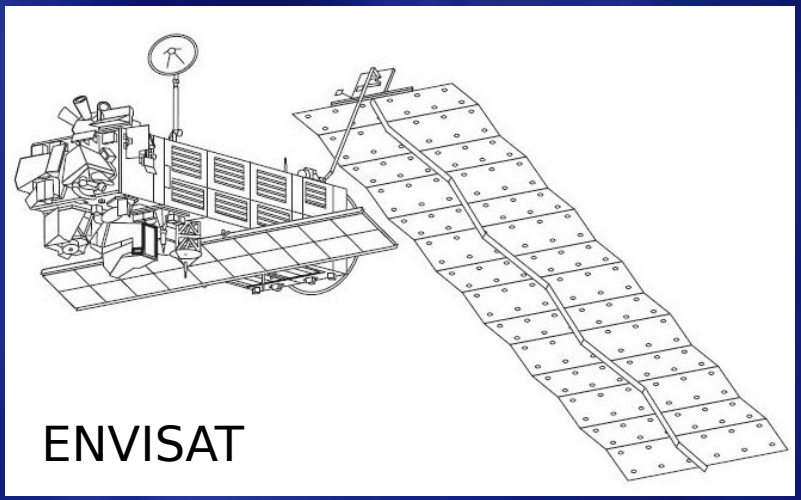
Level 1 = Calibrated and Geo-Located

Level 2 = Atmospherically Corrected Radiances and Derived

In-Water Products

- Output Bio-Optical Properties (Chlorophyll, Absorption, Scattering, Navy Products, Etc.)

MERIS sensor on ESA ENVISAT
Band set similar to MODIS / SeaWiFS
1000m & 300m resolution



Modifications to APS for MERIS Level-1 Processing to use the same Atmospheric Correction used for SeaWiFS and MODIS processing (Gordon/Wang with NIR Iteration)

Created the Relative Spectral Response (RSR) Tables

Created the software to read in MERIS N1 (Level-1) data from ESA

Modified L2GEN / N2GEN to handle MERIS data.

Obtained MERIS Rayleigh Tables from Goddard

Obtained MERIS Aerosol Tables from Goddard

Created scripts, area/info programs to handle MERIS N1 data from ESA

NRL hosted a Navy/NOAA /NASA and University Study Group working to assess MERIS data.

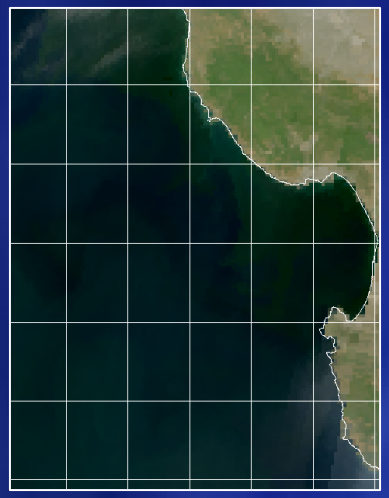
Monterey Bay, CA

June 19, 2008 18:23 GMT

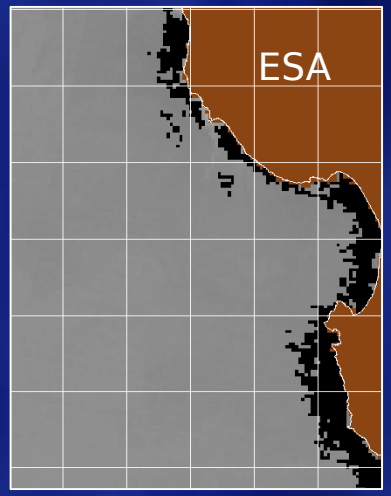
Inputs to APS:

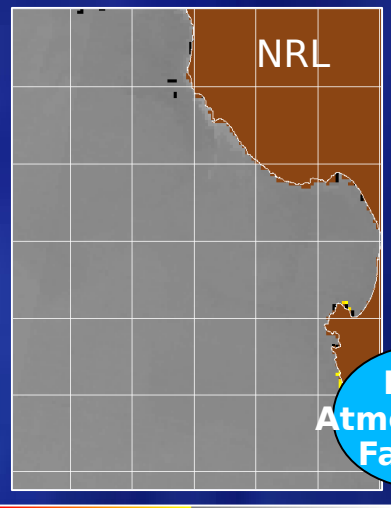
ESA = Level2
NRL = Level1

True Color

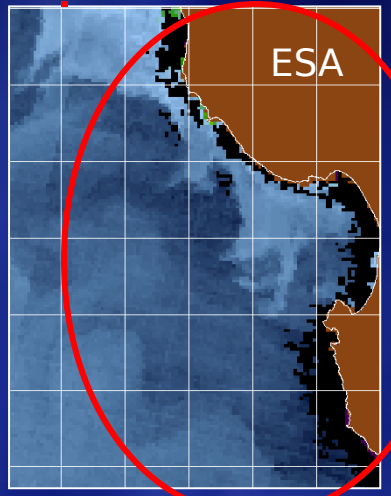


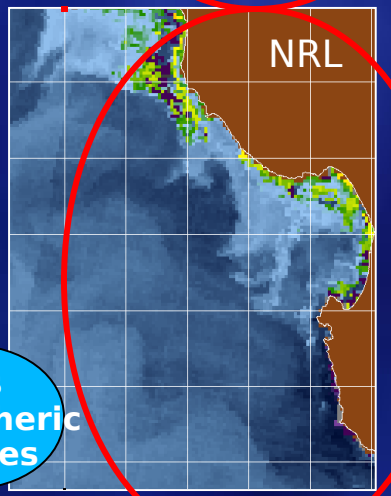
Rrs 490nm



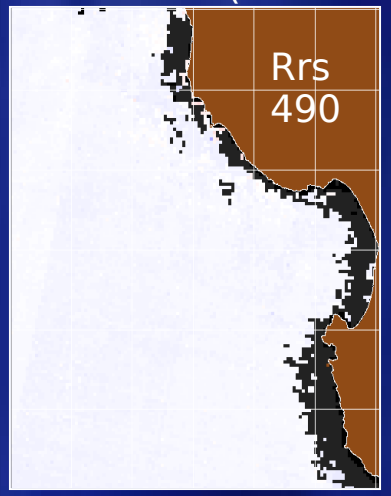


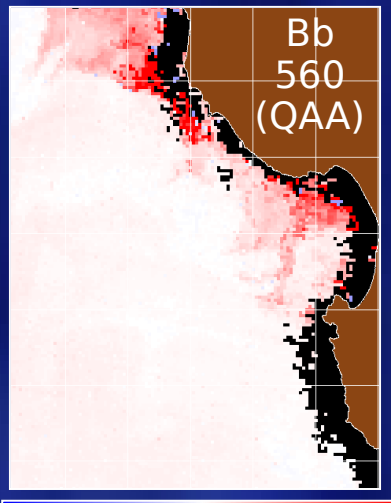
Bb 560nm (QAA)





Difference (ESA-NRL)





Less Atmospheric Failures

Rrs (1/sr)

-.03 -.018 -.006 .006 .018 .03

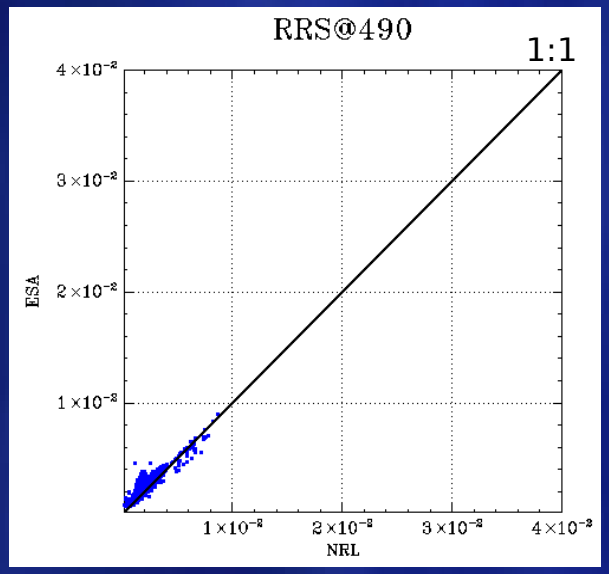
Bb (1/m)

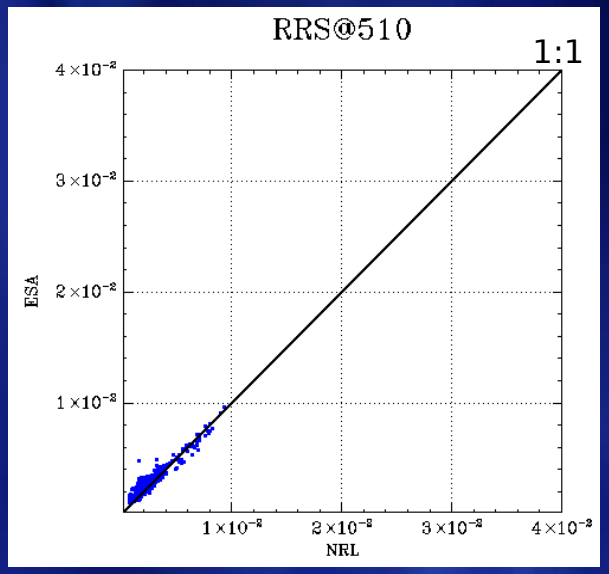
.0005 .002 .008 .032 .13 .5

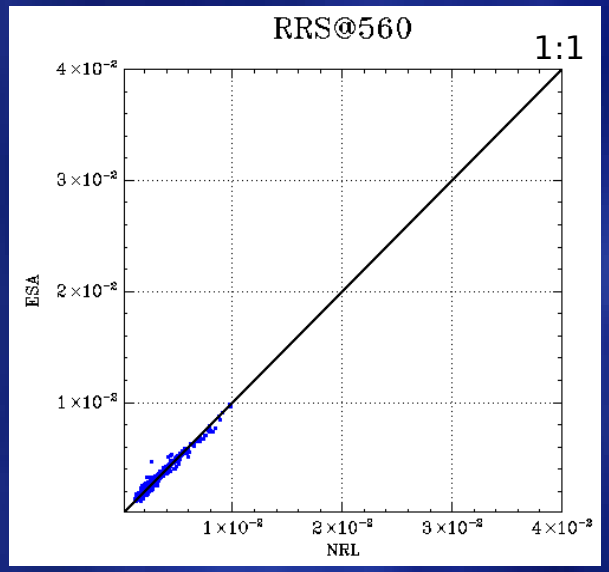
Rrs Difference (1/sr)

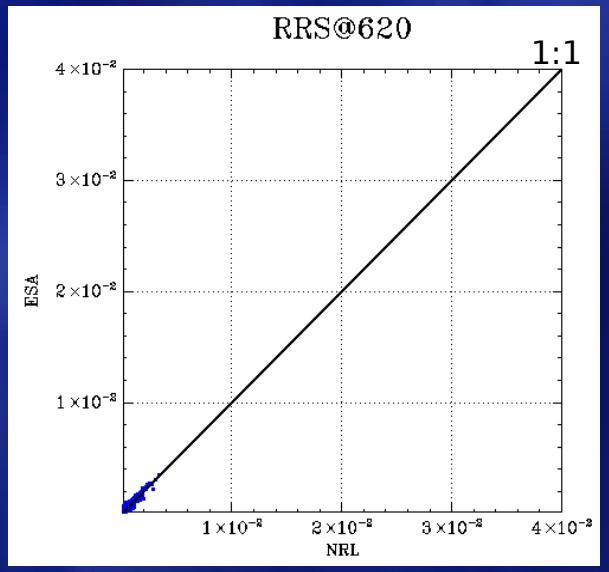
-.01 -.006 -.002 .002 .006 .01

Monterey Bay – Scatter Plots









Inputs to APS:

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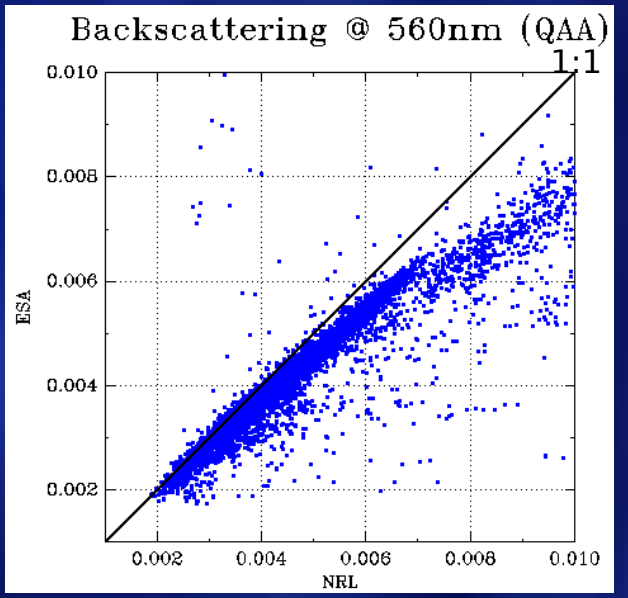
NRL = Level1



Yellow Sea

October 10, 2008 02:24 GMT

Inputs to APS:

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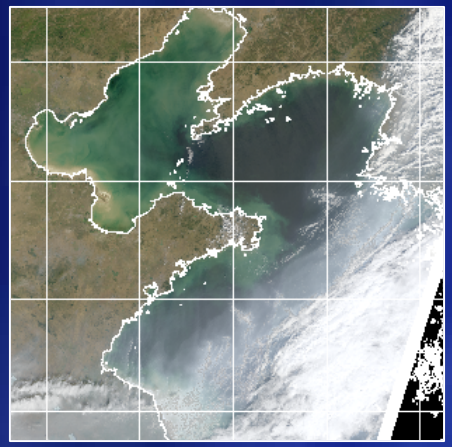
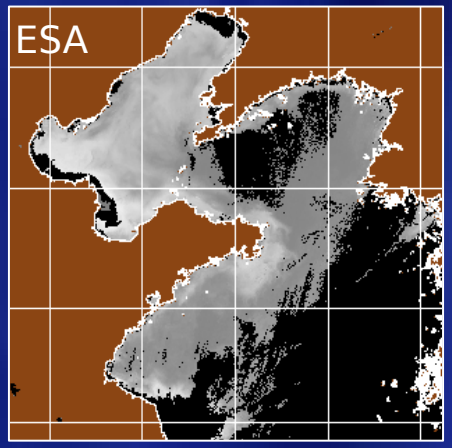
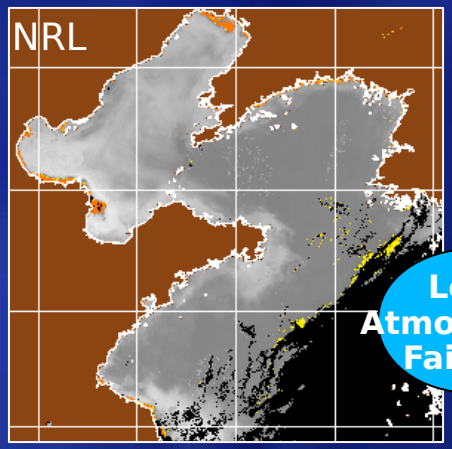
NRL = Level1

True Color

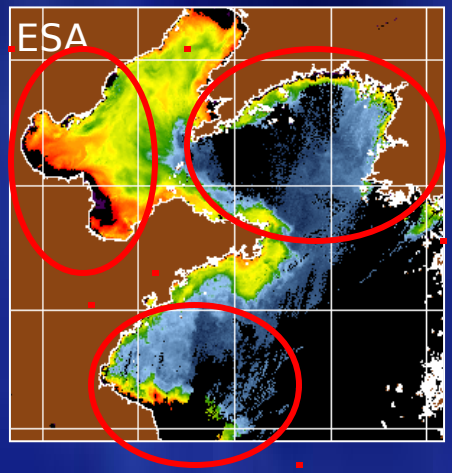


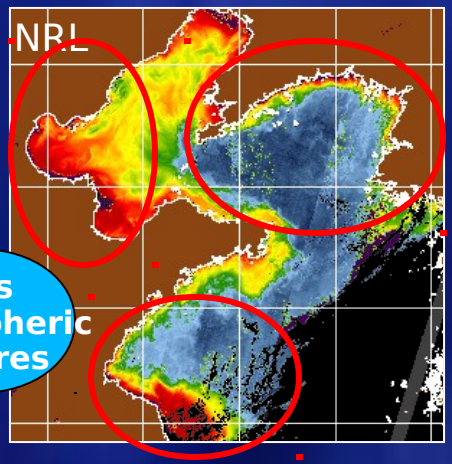
Rrs 510nm





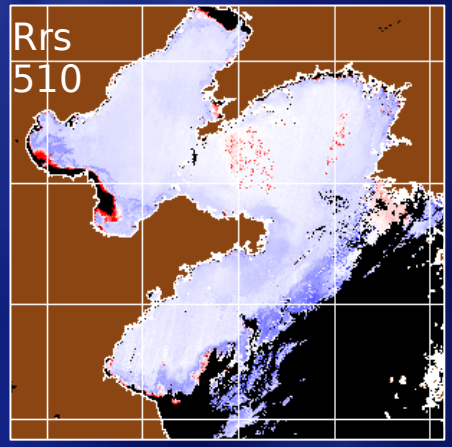
Bb 560nm (QAA)

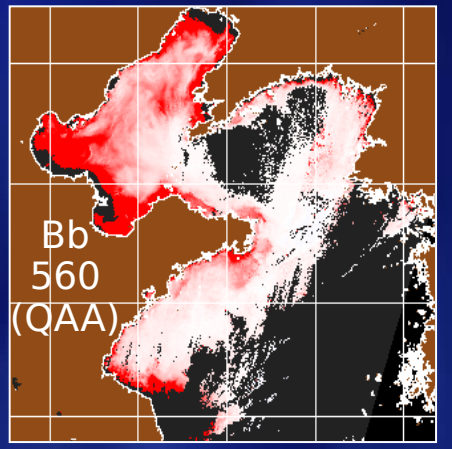




Less Atmospheric Failures

Difference (ESA – NRL)





Rrs (1/sr)

-.03 -.018 -.006 .006 .018 .03

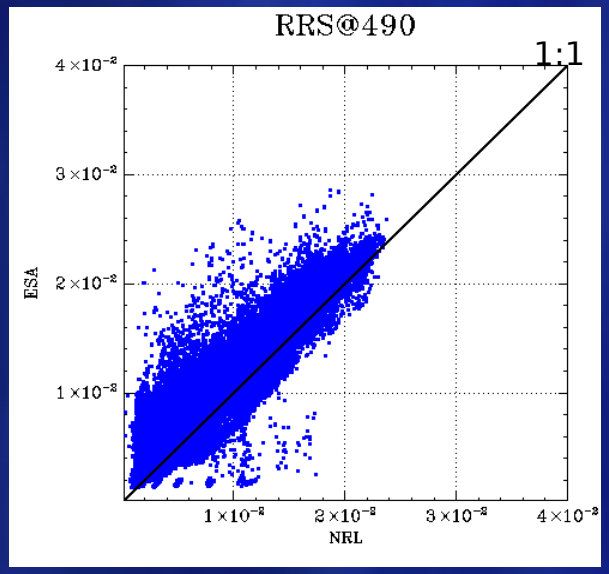
Bb (1/m)

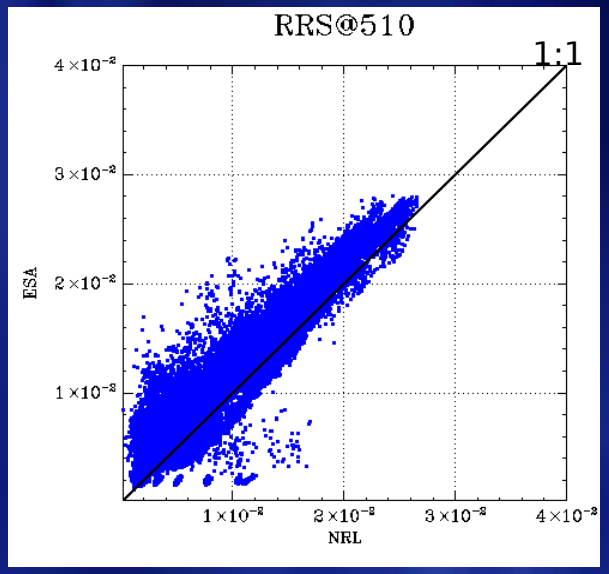
.0005 .002 .008 .032 .13 .5

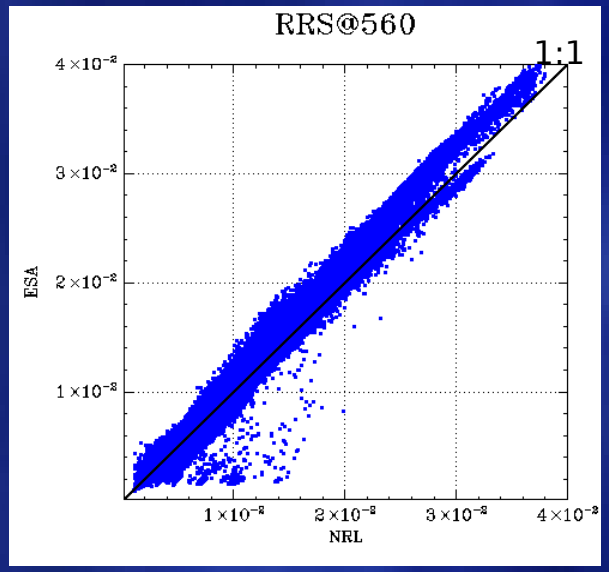
Rrs Difference (1/sr)

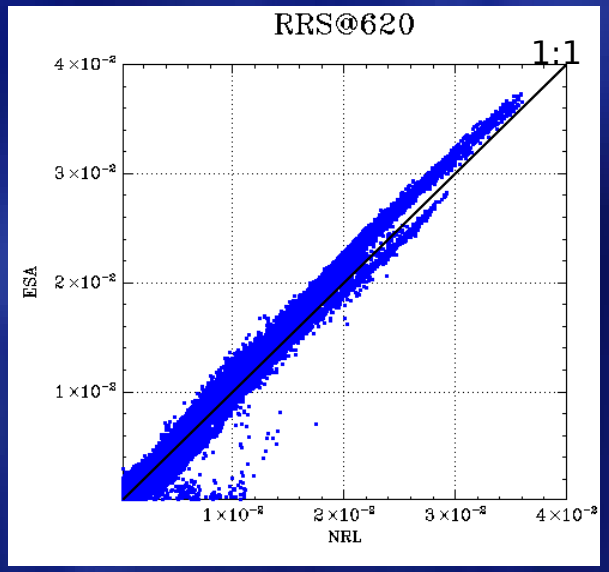
-.01 -.006 -.002 .002 .006 .01

Yellow Sea – Scatter Plots









Inputs to APS:

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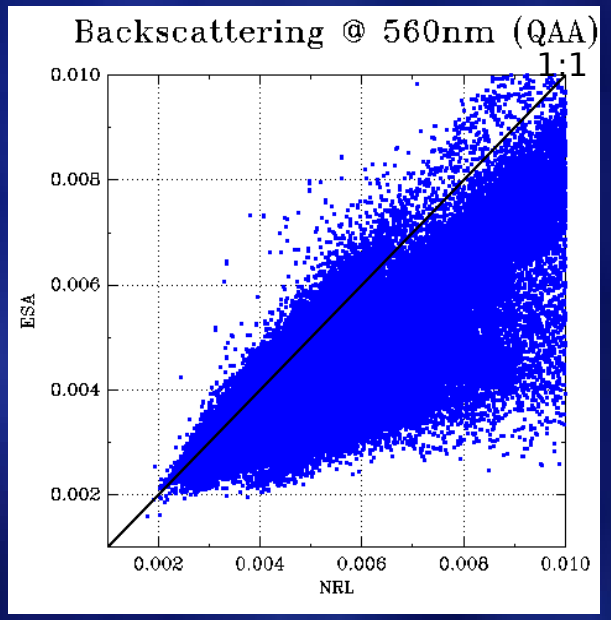
NRL = Level1



Gulf of California, CA

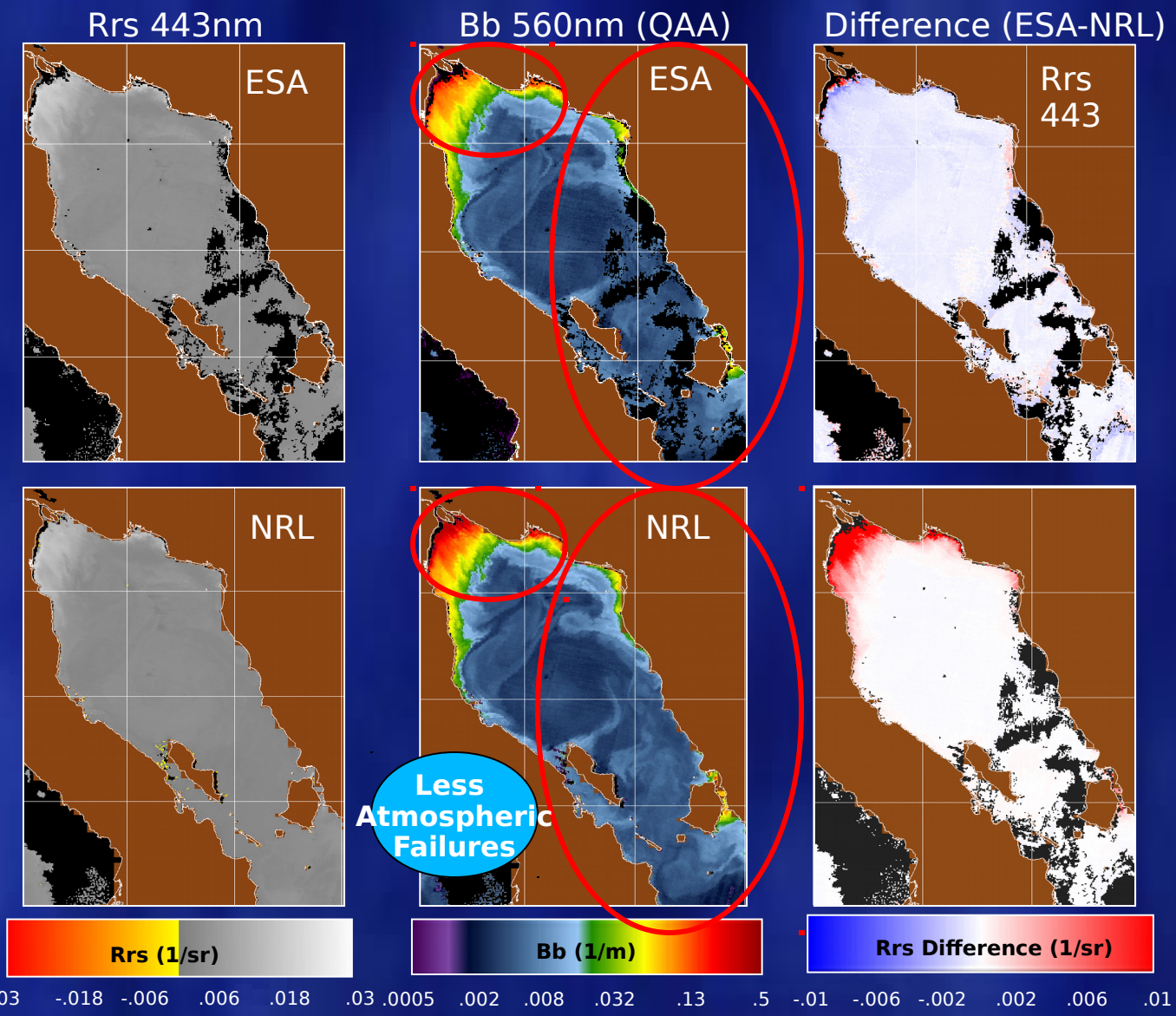
July 22, 2008 17:47 GMT

QinetiQ North America

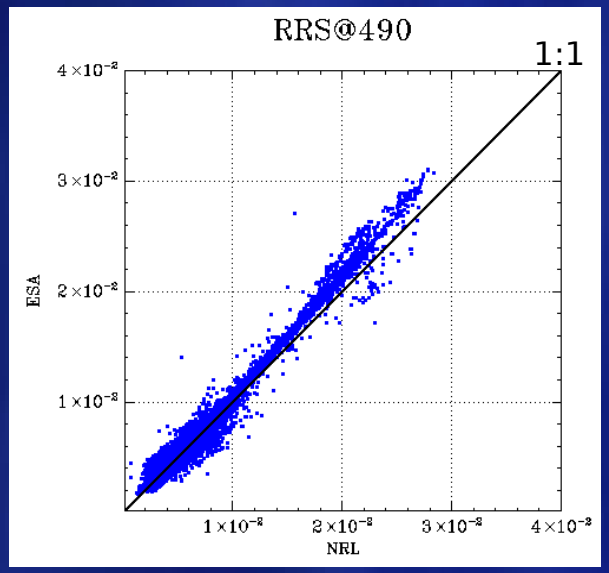
Inputs to APS:

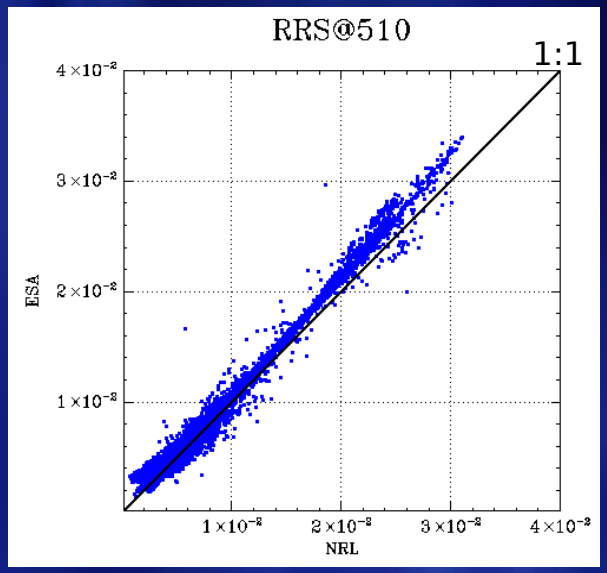
ESA = Level2
NRL = Level1

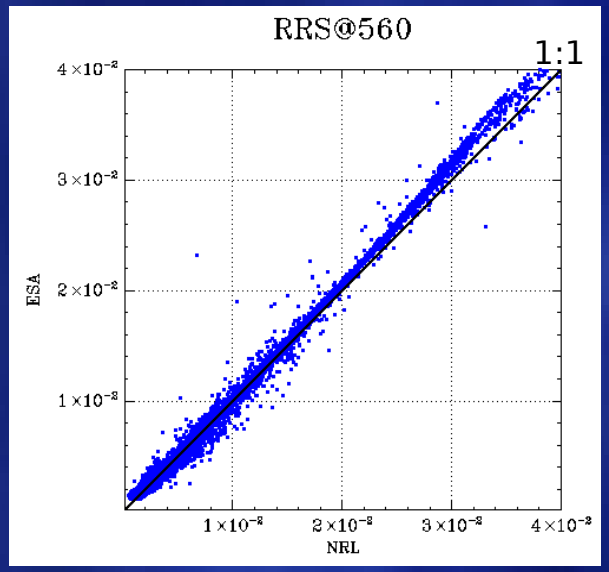
True Color

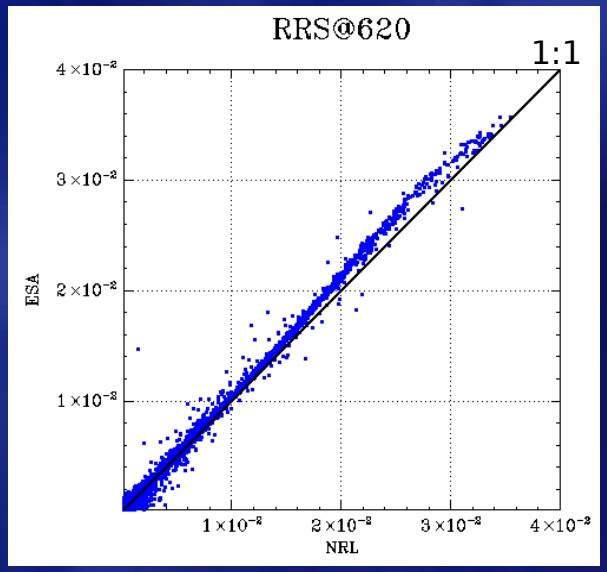


Gulf of California – Scatter Plots









Inputs to APS:

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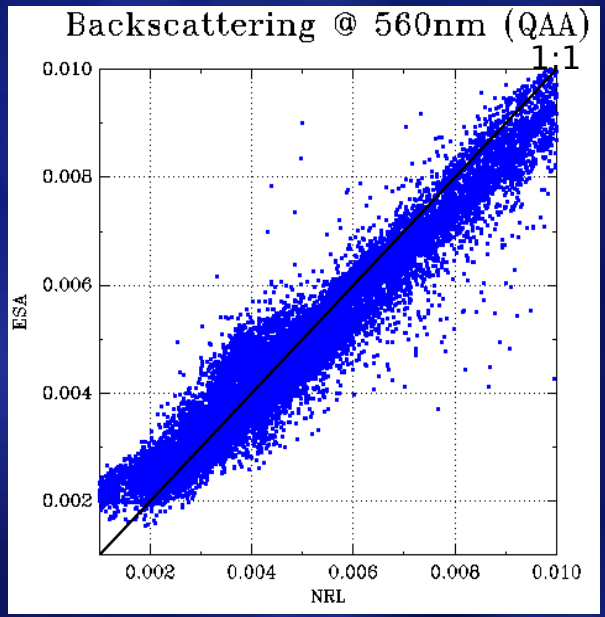
NRL = Level1



Martha's Vineyard (MVCO)

October 04, 2008 15:37 GMT

QinetiQ North America

Inputs to APS:

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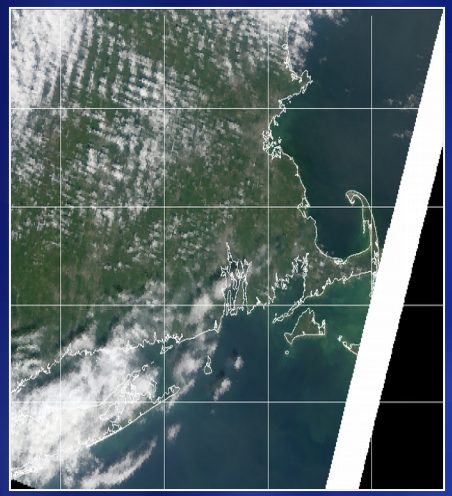
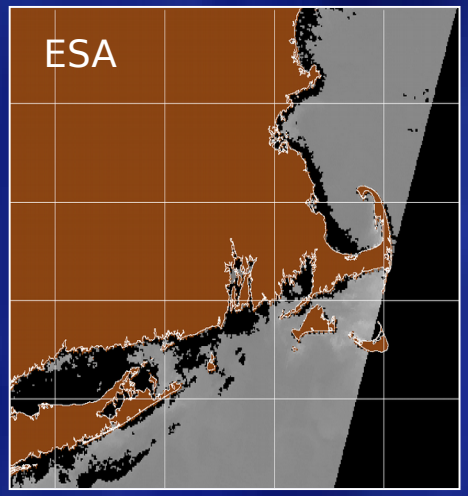
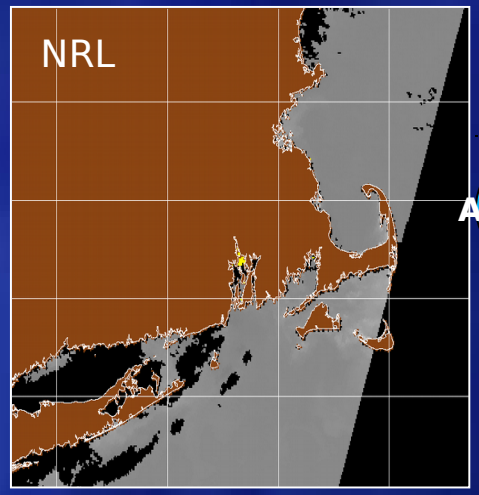
NRL = Level1

True Color

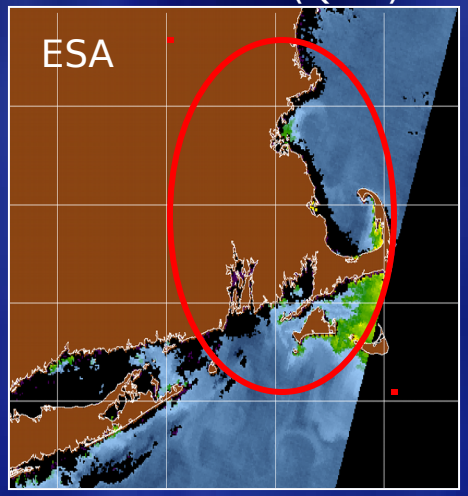


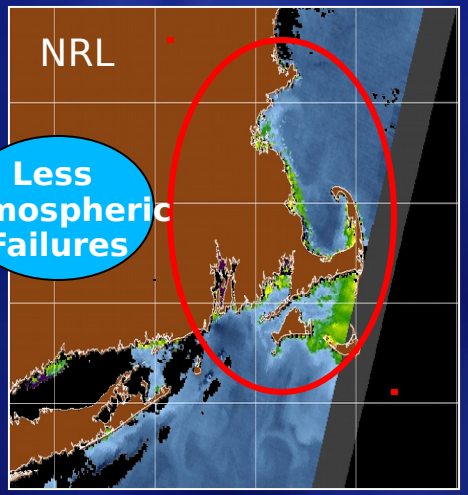
Rrs 560nm





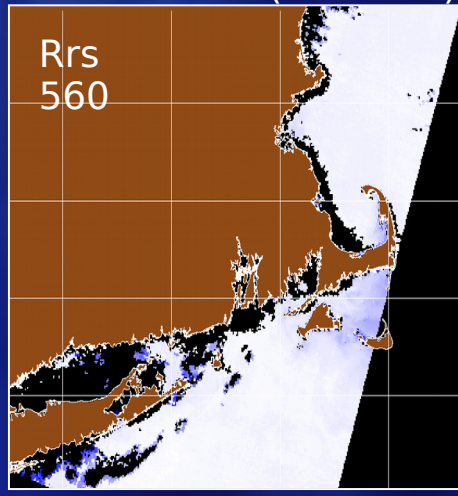
Bb 560nm (QAA)

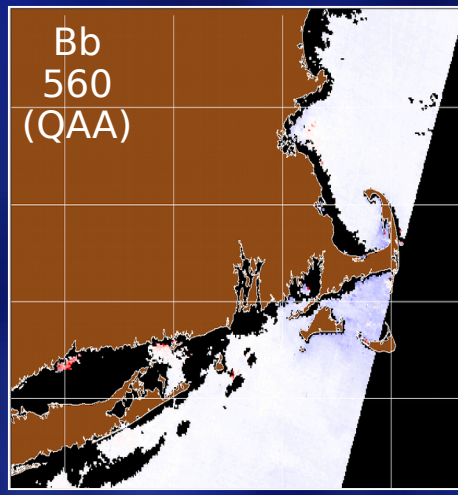


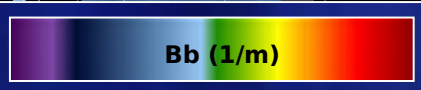


Less Atmospheric Failures

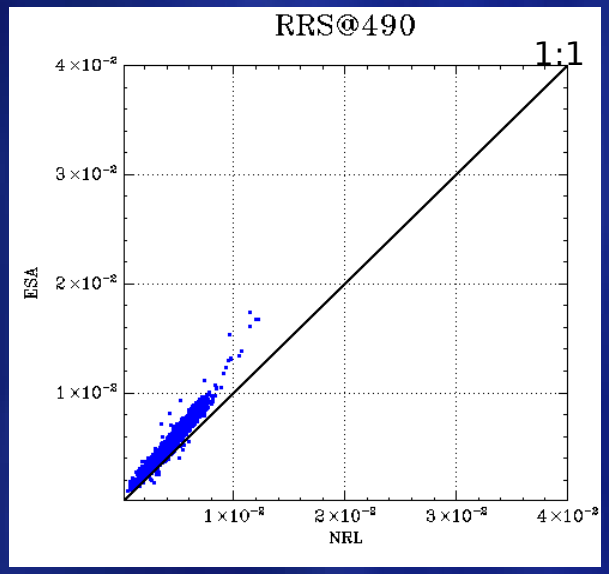
Difference (ESA-NRL)

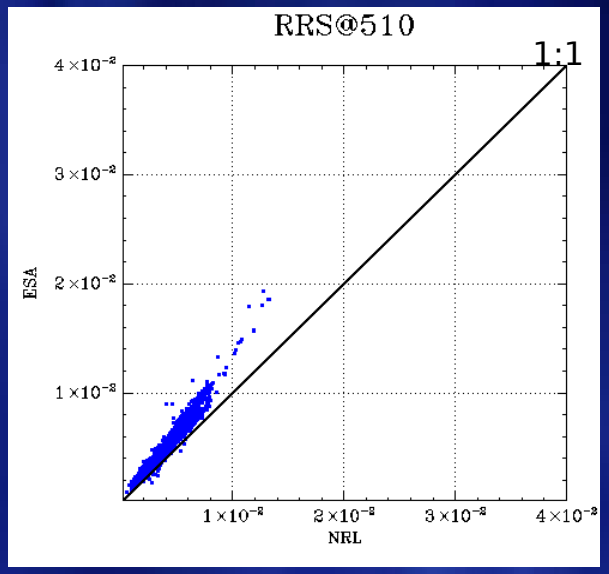


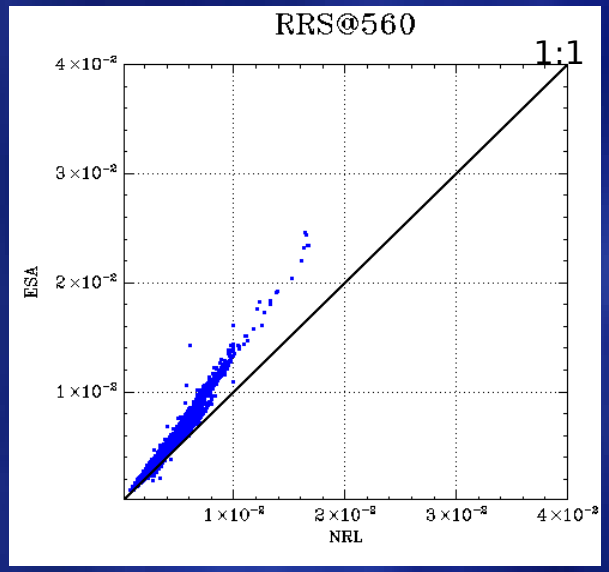


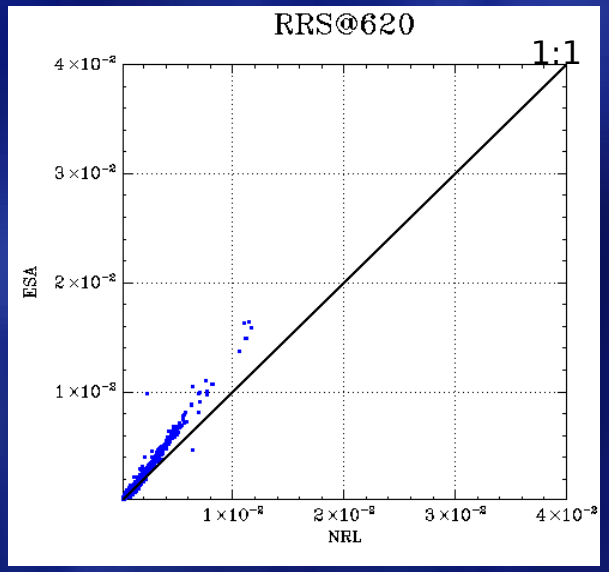


Martha's Vineyard – Scatter Plots









Inputs to APS:

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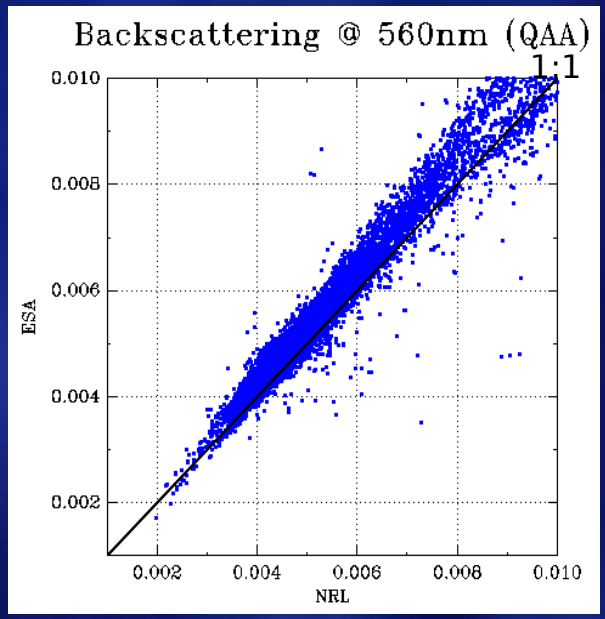
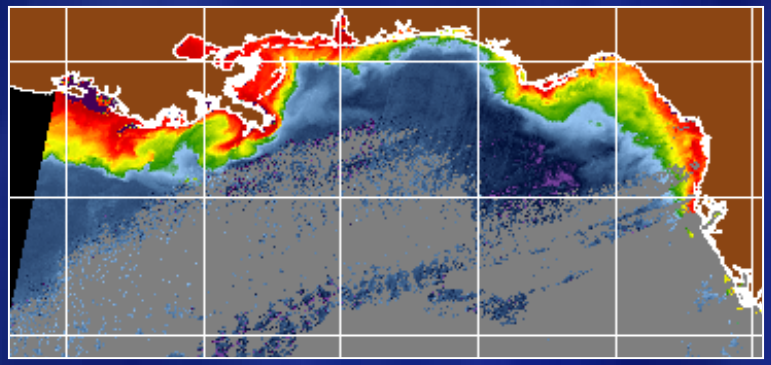
NRL = Level1



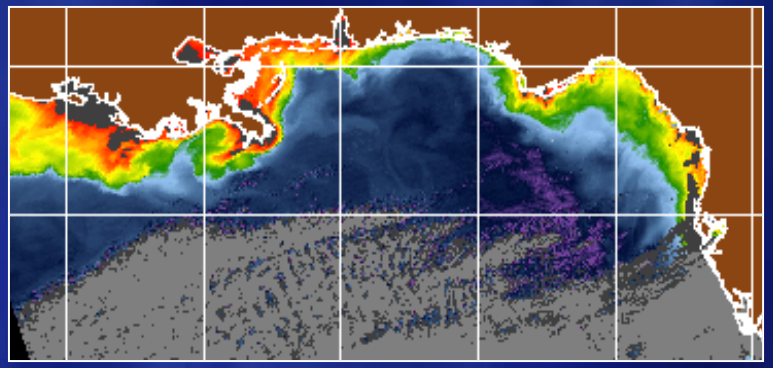
MERIS vs. MODIS (NRL)

March 20, 2008 16:04 GMT

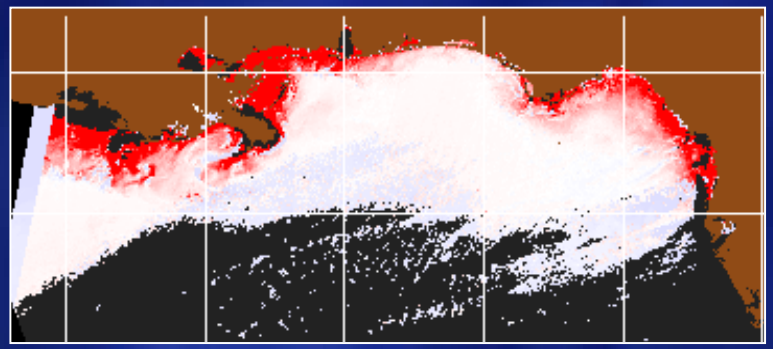
MERIS Bb 560nm (QAA)



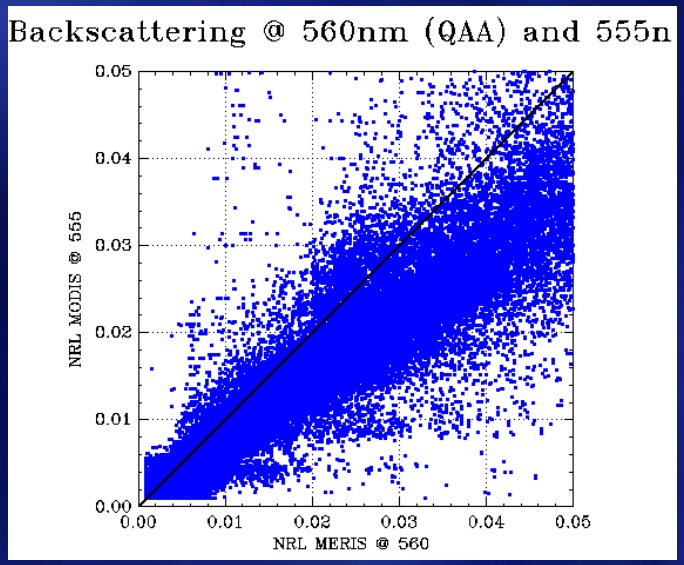
MODIS Aqua Bb 555nm (QAA)



Difference (MERIS – MODIS)



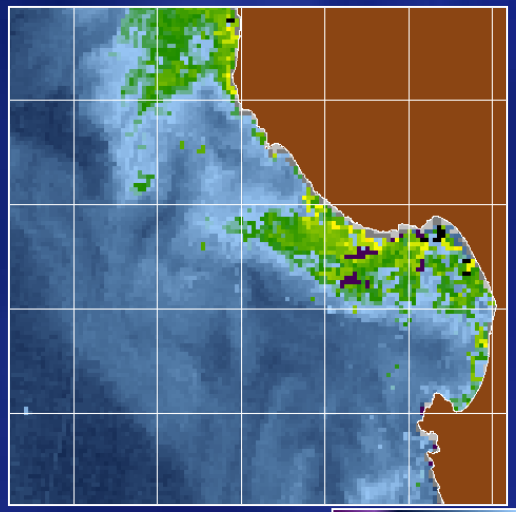
Which One Is More Accurate?



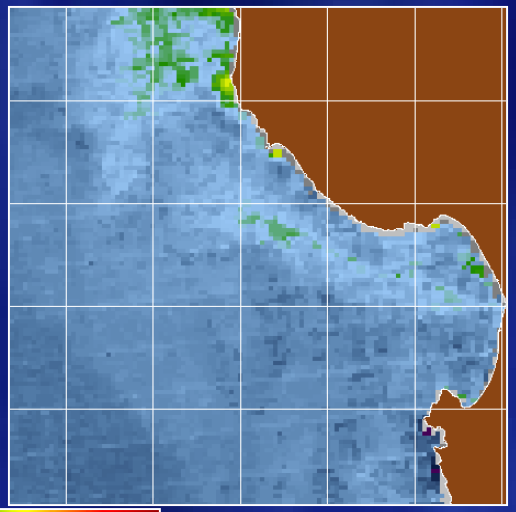
MERIS vs. MODIS (NRL)

March 20, 2008 16:04 GMT

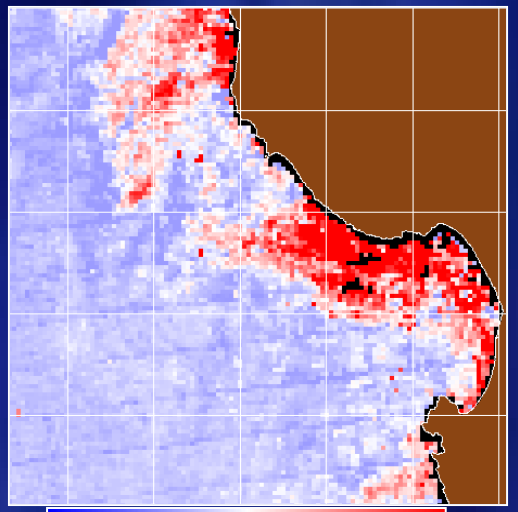
MERIS Bb 560nm (QAA)

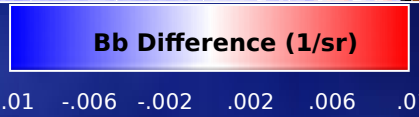


MODIS Aqua Bb 555nm (QAA)

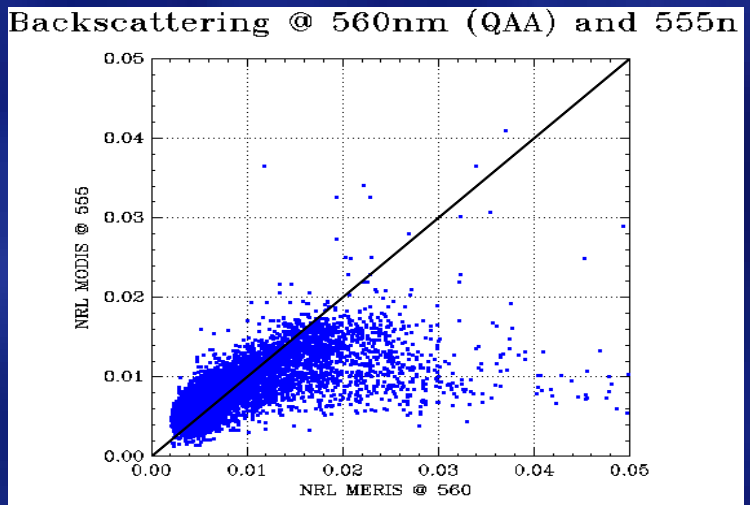


Difference (MERIS – MODIS)



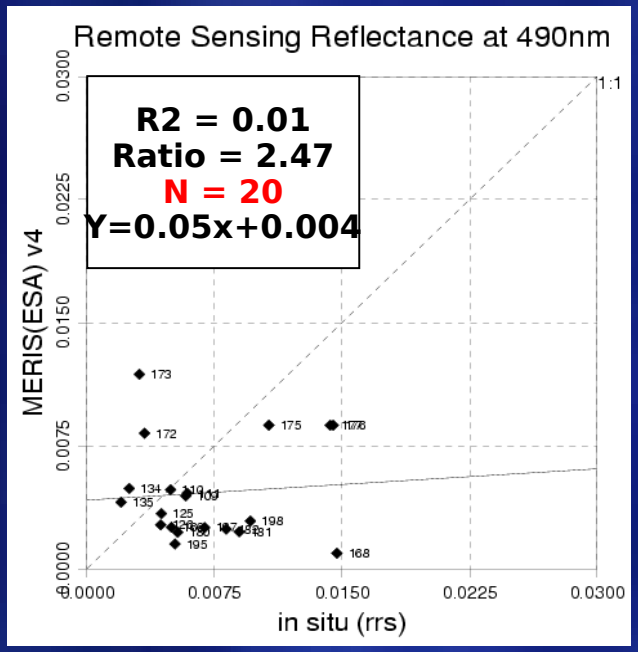


Which One Is More Accurate?

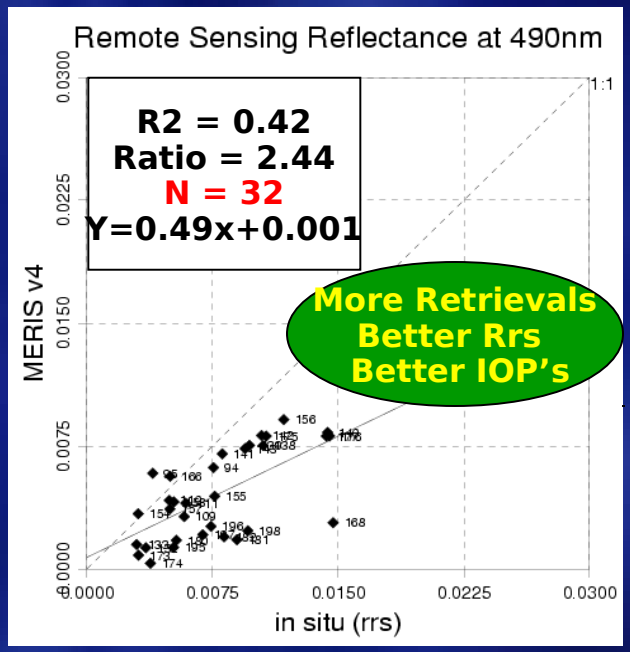


MERIS vs. Insitu Rrs @ 490nm (Scatter Plots)

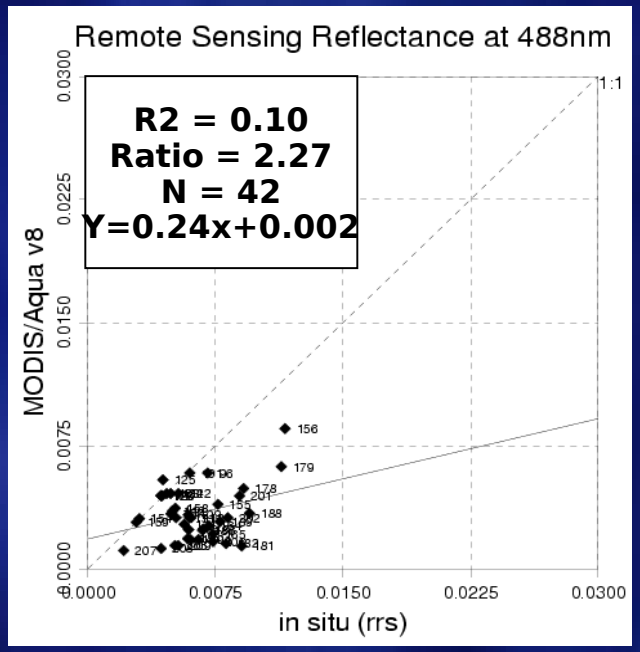
MERIS ESA = 20 Match-ups



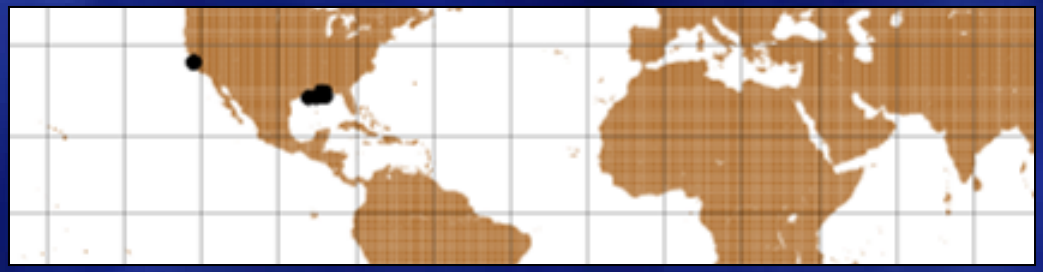
MERIS NRL = 32 Match-ups



MODIS NRL = 42 Match-ups

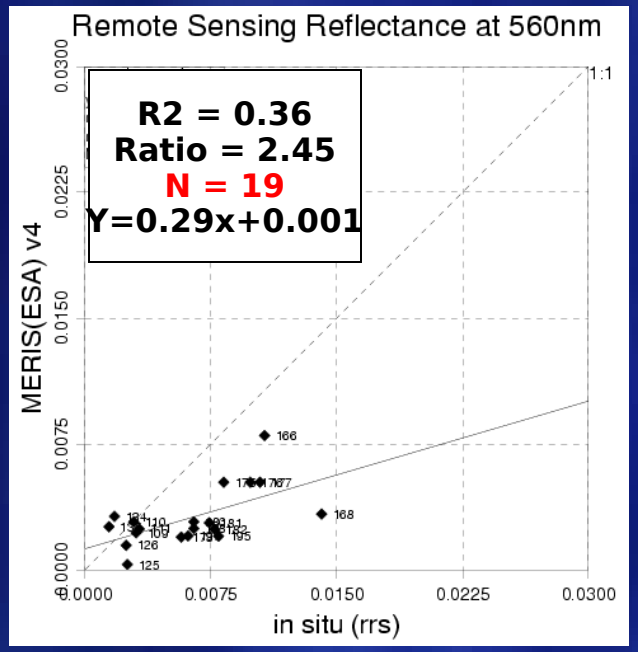


Station Locations
Northern Gulf of Mexico
Monterey Bay, CA

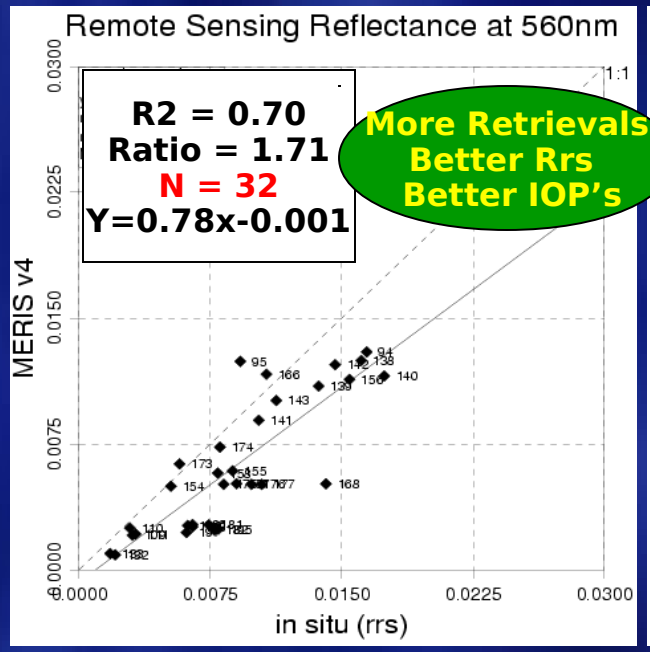


MERIS vs. Insitu Rrs @ 560nm (Scatter Plots)

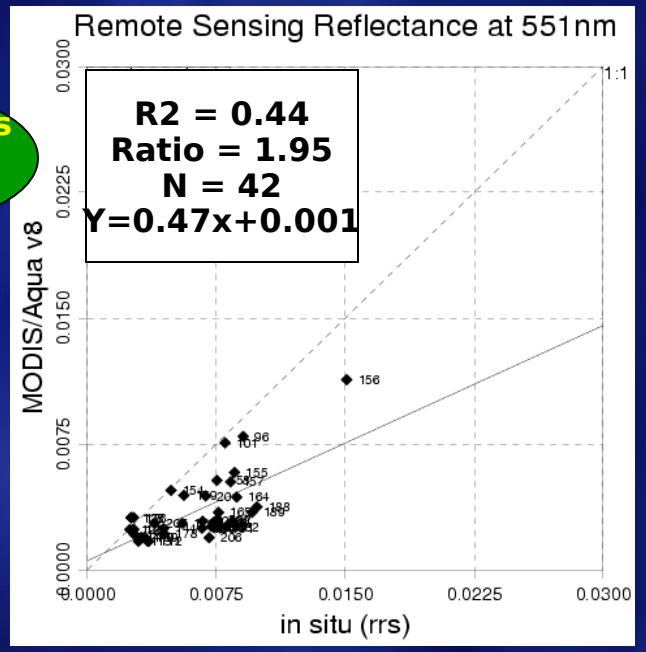
MERIS ESA = 19 Match-ups



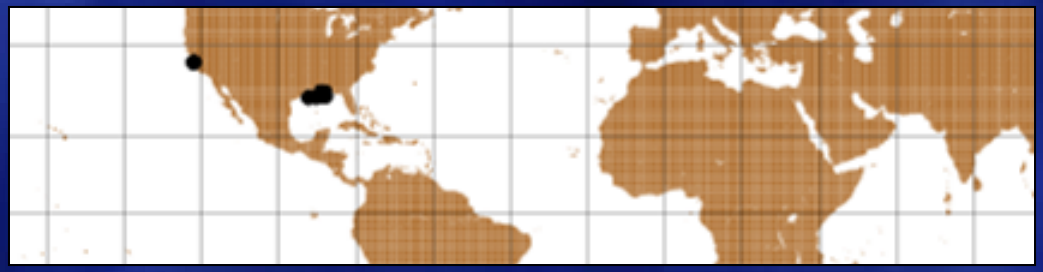
MERIS NRL = 32 Match-ups



MODIS NRL = 42 Match-ups



Station Locations
Northern Gulf of Mexico
Monterey Bay, CA



Summary

- Atmospheric Correction Failures are more significant in MERIS ESA processing (Coastal and Offshore).
- Remote Sensing Reflectances and Backscattering estimates from MERIS ESA vs. NRL processing schemes produce similar results.
- Backscattering estimates from NRL MERIS processing are lower in coastal regions.
- MERIS Satellite and In-situ Match-ups for Remote Sensing Reflectance are better using NRL processing scheme compared to MERIS from ESA processing and MODIS-Aqua.

Questions?